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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/574,032
Filing Date: March 27, 2006
Appellant(s): SHIMAMURA ET AL.

Michelle L. Knight
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed May 14, 2010 appealing from the Office action mailed November 05, 2009.

1) ***Real Party in Interest***

A statement identifying the real party in interest is contained in the brief.

2) ***Related Appeals and Interferences***

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

3) ***Status of Claims***

The statement of the status of the claims contained in the brief is correct.

4) ***Status of Amendments After Final***

The Appellants' statement of the status of amendments after final rejection contained in the brief is correct.

5) ***Summary of Claimed Subject Matter***

The summary of claimed subject matter contained in the brief is correct.

6) ***Grounds of Rejection to be Reviewed on Appeal***

The Appellants' statement of the grounds of rejection in the brief is correct.

7) ***Claims Appendix***

The copy of the appealed claims contained in the Appendix to the brief is correct.

8) ***Evidence Relied Upon***

Hisamitsu et al. (US 2004/0126655 A1)

Delnick (US 5,865,860)

Triplett (US 3,566,985)

Kung (US 5,389,471)

Munshi (US 6,645,675 B1)

9) ***Grounds of Rejection***

1. Claims 1, 4-6, 8-14 and 20-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over HISAMITSU et al. (US 2004/0126655 A1) in view of DELNICK (US 5,865,860).

As to Claims 1, 6, 8, 20 and 22, HISAMITSU et al. teaches of a lithium ion battery (pg. 4, [0044]) comprising an anode, cathode and an electrolyte layer (Abstract). HISAMITSU et al. further teaches using an ink-jet method for forming all of the layers of the battery including the electrolyte layer (pg. 3, [0038]-[0039]). HISAMITSU et al. does not specifically disclose wherein the electrolyte layer consists of a pattern of individual insulating particles which electrolytes occupying the interstitial spaces.

However, DELNICK discloses a battery comprising a cathode, an anode, and an electrolyte layer provided between said cathode and anode. Said electrolyte layer comprises a porous separator structure comprising individual insulating particles of silica or alumina and a

polymer binder (col. 5, lines 36-57) wherein electrolytes are applied via ink-jet printing so as to uniformly occupy the interstitial spaces of the porous separator structure (Abstract). At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify the battery of HISAMITSU et al. with the separator having electrolytes occupying the interstitial spaces thereof, because DELNICK teaches that ink-jet method allows for the electrolyte to be uniformly and accurately distributed throughout the pore structure of the separator thereby allowing for a simplified manufacturing process (Abstract). Furthermore, it is the position of the Examiner that the electrolyte layer of DELNICK produced by the method of HISAMITSU et al. would inherently consist essentially of a pattern of insulating particles comprising a plurality of interstitial spaces therebetween, wherein electrolytes occupy a majority of the interstitial spaces, given that the materials and method of making of DELNICK, HISAMITSU et al. and the present application are the same. A reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature is necessarily present in that which is described in the reference. Inherency is not established by probabilities or possibilities. *In re Robertson*, 49 USPQ2d 1949 (1999).

As to Claim 4, HISAMITSU et al. teaches that it is preferable to have particle sizes of all the consistent materials for the battery, which are produced via ink-jet method, to be 5 microns or smaller (pg. 4, [0048]).

As to Claim 5, HISAMITSU et al. does not specifically disclose the thickness of the electrolyte layer.

However, DELNICK discloses wherein the thickness of the electrolyte layer is between 5-20 microns (col. 5, lines 36-57). The courts have held that in the case wherein the claimed

ranges "overlap or lie inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976).

As to Claim 9, HISAMITSU et al. discloses wherein the positive electrode comprises a lithium-transition metal composite oxide and the anode comprises carbon (pg. 4, [0044]-[0045]).

As to Claims 10 and 13, HISAMITSU et al. discloses a polymeric electrolyte comprising PEO and NMP (pg. 4, [0047]). HISAMITSU et al. does not specifically disclose the claimed method.

However, DELNICK discloses applying the separator comprising individual insulating particles of alumina and silica onto at least the cathode or the anode, and further filling the interstitial spaces of said separator with the electrolyte via an ink-jet method (col. 4, lines 4-10). At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify the method of manufacturing a battery of HISAMITSU et al. with that of DELNICK, because DELNICK teaches that the volume and distribution of electrolytes through a separator can be accurately and uniformly controlled in such a manner (Abstract).

As to Claim 11, HISAMITSU et al. discloses using ink-jet printing as a method for manufacturing a battery (pg. 3, [0038]-[0039]).\

As to Claim 12, HISAMITSU et al. discloses wherein the battery components can be simultaneously printed as required, via ink-jet printing (pg. 5, [0058]).

As to Claim 14, HISAMITSU et al. does not specifically disclose the thickness of the electrolyte layer.

However, DELNICK discloses wherein the thickness of the electrolyte layer is between 5-20 microns (col. 5, lines 36-57). The courts have held that in the case wherein the claimed

ranges "overlap or lie inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976).

As to Claim 20, HISAMITSU et al. discloses wherein the ink-jet printing method of the battery components allows for patterns to be produced (pg. 5, [0058]).

As to Claims 21 and 23, the combination of HISAMITSU et al. and DELNICK does not expressly disclose the patterns claimed by the applicant. However, the courts have held that the configuration of the pattern is a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular configuration of the claimed patterns was significant, *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966) (MPEP 2144.01).

2. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over HISAMITSU et al. (US 2004/0126655 A1) in view of DELNICK (US 5,865,860) as applied to claims 1, 4-6, 8-14 and 20-23 above, and further in view of KUNG (US 5,389,471).

As to Claim 3, HISAMITSU et al. and DELNICK does not specifically disclose the porosity (void ratio) of the electrolyte layer.

However, KUNG teaches of a separator comprising alumina particles (claim 3), wherein the porosity is controlled so as to be form 40-90% (Claim 4). At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify the separator of HISAMITSU et al. and DELNICK so as to have a porosity of 40-90%, because KUNG teaches that having a separator with such a porosity allows for greater electrolyte retention capabilities which increases battery life col. 1, lines 18-21).

3. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over HISAMITSU et al. (US 2004/0126655 A1) in view of DELNICK (US 5,865,860) as applied to claims 1, 4-6, 8-14 and 20-23 above, and further in view of MUNSHI (US 6,645,675 B1).

As to Claim 7, the disclosure of HISAMITSU et al. as discussed above in claim 1 is incorporated herein. HISAMITSU et al. does not expressly disclose the battery according to claim 1 wherein the individual insulating particles comprise olefin resins.

However, MUNSHI teaches a state of the art lithium ion battery using a carbon electrode as the anode and a lithiated metal oxide as the cathode. A microporous separator of polypropylene or polyethylene (olefin resin) is used for separating the two electrodes, with an electrolyte comprised of a lithium salt and a liquid organic solvent usually absorbed into said separator (col. 1, lines 43-54). At the time of the invention, it would have been obvious to one of ordinary skill in the art to substitute a microporous separator comprising a polyolefin resin such as polyethylene, as taught by MUNSHI, for the electrolyte layer of HISAMITSU et al. and DELNICK, because polyethylene is well known for being a great insulator for the electrodes and absorber of electrolyte for lithium-ion batteries and the substitution of one known element (separator comprising an olefin resin) for another (separator comprising alumina) would have yielded the predictable results.

4. Claims 15-16 and 24-27 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of HISAMITSU et al. (US 2004/0126655 A1) in view of DELNICK (US 5,865,860) and TRIPLETT (US Patent No. 3,566,985).

As to Claims 15-16, 24 and 26, TRIPLETT teaches an electric vehicle driven by an electric motor which is powered by a DC battery having a plurality of cells (battery assembly) (Abstract). TRIPLETT does not specifically disclose the electrolyte layer claimed in claims 15-16.

However, DELNICK discloses a battery comprising a cathode, an anode, and an electrolyte layer provided between said cathode and anode. Said electrolyte layer comprises a porous separator structure comprising individual insulating particles of silica or alumina and a polymer binder (col. 5, lines 36-57) wherein electrolytes are applied via ink-jet printing so as to uniformly occupy the interstitial spaces of the porous separator structure (Abstract). At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify the electric vehicle comprising a plurality of batteries of TRIPLETT with the separator having electrolytes occupying the interstitial spaces thereof, because DELNICK teaches that providing an electrolyte layer made by an ink-jet method allows for the electrolyte to be uniformly and accurately distributed throughout the pore structure of the separator thereby allowing for a simplified manufacturing process (Abstract). DELNICK does not specifically disclose wherein the electrolyte layer consists essentially of individual insulating particles individually applied directly to at least one of the cathode and the anode.

However, HISAMITSU et al. teaches of a lithium ion battery (pg. 4, [0044]) comprising an anode, cathode and an electrolyte layer (Abstract). HISAMITSU et al. further teaches using an ink-jet method for forming all of the layers of the battery including the electrolyte layer (pg. 3, [0038]-[0039]). At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify the separator of DELNICK by forming said separator comprising

insulating particles by an ink-jet method, because HISAMITSU et al. teaches that patterns, shape and size of the battery components (such as separator) can be freely and easily controlled (pg. 5, [0058]). Furthermore, it is the position of the Examiner that the electrolyte layer of DELNICK produced by the method of HISAMITSU et al. would inherently consist essentially of a pattern of insulating particles comprising a plurality of interstitial spaces therebetween, wherein electrolytes occupy a majority of the interstitial spaces, given that the materials and method of making of DELNICK, HISAMITSU et al. and the present application are the same. A reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature is necessarily present in that which is described in the reference. Inherency is not established by probabilities or possibilities. *In re Robertson*, 49 USPQ2d 1949 (1999). The combination does not expressly disclose the battery assembly as being capable for powering a vehicle.

As to Claims 25 and 27, the combination of TRIPLETT, DELNICK and HISAMITSU et al. does not expressly disclose the patterns claimed by the applicant. However, the courts have held that the configuration of the pattern is a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular configuration of the claimed patterns was significant, *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966) (MPEP 2144.01).

10) *Response to Arguments*

1. Examiner ignores certain claim language such as wherein the electrolyte layer consists essentially of a pattern of individual insulating particles and that each particle is selectively arranged directly on the cathode or the anode (claim 1).

Hisamitsu et al. discloses a lithium ion battery wherein all the layers of said battery are formed via ink-jet printing (pg. 3, [0038]-[0039]), which is the same process used in the present application. Hisamitsu et al. further discloses that each layer can be applied in predetermined patterns respectively (paragraph [0039]). Delnick teaches of an electrolyte layer comprising a plurality of individual insulating particles and having a plurality of interstitial spaces for which the electrolyte occupies (col. 5, lines 36-57). Delnick further teaches that ink-jet printing is used to distribute the electrolyte throughout the interstitial spaces of the separator (individual insulating particles) (abstract).

2. Hisamitsu refers to the pattern in which the layers are formed, not a pattern in which individual insulating particles of the electrolyte layers are formed (claim 1).

Hisamitsu clearly teaches that the patterns of each of the layers can be freely controlled (paragraphs [0055]-[0058]). By modifying the electrolyte layer of Hisamitsu with that of Delnick, the electrolyte layer formed by ink-jet printing comprises a predetermined pattern of insulating particles of Delnick, where electrolyte occupy the interstitial spaces therebetween.

3. Delnick teaches an electrolyte layer comprising insulating particles and a polymer binder and the Examiner ignores the language, "consisting essentially of" and furthermore, the individual particles cannot possibly be patterned as claimed (claim 1)..

According to MPEP 2111.03, absent a clear indication in the specification or claims of what the basic and novel characteristics actually are, "consisting essentially of" will be construed as equivalent to "comprising." Furthermore, Appellant's disclosure indicated that the claimed

electrolyte layer can contain more than said individual insulating particles and electrolytes occupying the interstitial spaces between said particles (paragraphs [0167]-[0168] of the PGPub). Furthermore, there is no evidence that the presence of a binder would materially affect the basic and novel characteristic of the claimed invention. The presence of a binder would not affect the basic and novel characteristics of the claimed lithium ion battery wherein an electrolyte layer comprising a pattern of individual insulating particles wherein electrolytes occupy the interstitial spaces between said particles are present and the battery would still function properly. The separator of Delnick does in fact prevent a short-circuit between the anode and the cathode, otherwise the battery would not function. Furthermore, Appellant's disclosure in paragraphs [0167]-[0168] shows the electrolyte layer which comprises more than just the electrolytes and the individual insulating particles. Furthermore, the individual insulating particles of Delnick, applied via ink-jet printing in a predetermined pattern as taught by Hisamitsu, are directly formed in a pattern on either the cathode or the anode.

4. Hisamitsu modified by Delnick will not inherently provide an electrolyte layer consisting essentially of a pattern of insulating particles comprising a plurality of interstitial spaces therebetween, whereby the electrolytes occupy said spaces (claim l).

The battery and method of Hisamitsu comprising the electrolyte layer of Delnick will provide an electrolyte layer in a predetermined pattern onto either the cathode or the anode. The individual insulating particles present in said electrolyte layer of Delnick will inherently be part of the predetermined pattern given that the materials and method used are very similar. A reference which is silent about a claimed invention's features is inherently anticipatory if the

missing feature is necessarily present in that which is described in the reference. Inherency is not established by probabilities or possibilities. *In re Robertson*, 49 USPQ2d 1949 (1999).

5. Hisamitsu and Delnick do not disclose the method of claim 10 (claim 10).

Hisamitsu et al. discloses using an ink-jet method for forming an electrolyte layer in a predetermined pattern. Delnick teaches an electrolyte layer comprising the same materials recited in claim 1. Hisamitsu et al. discloses forming layer by applying inks in predetmined patterns, wherein said electrolyte layer, modified by Delnick, comprises individual insulating particles. The electrolyte mixture applied as a layer will have an equal dispersing of the binder within the insulating particles and some of the insulating particles will directly be applied (direct contact with) to one of the anode or the cathode.

6. The prior arts do not teach the simultaneous application of insulating partciles and the electrolytic polymer (claim 12).

Delnick teaches applying the electrolyte to the insulating particle separator structure (abstract). Delnick does not disclose if the electrolytes are formed after the formation of the separator or during. However, Hisamitsu et al. discloses wherein the battery components (including separator layer and electrolyte) can be applied simultaneously (paragraph [0058]).

7. Kung does not teach a pattern of individual insulating particles having a plurality of interstitial spaces therebetween, with electrolytes occupying said spaces (claim 3).

Kung was not used to teach this limitation of claim 1. Hisamitsu modified by Delnick teach the limitations of claim 1, as described above.

8. Triplett does not teach a pattern of individual insulating particles having a plurality of interstitial spaces therebetween, with electrolytes occupying said spaces (claims 15-16).

Triplett was not used to teach this limitation of claim 1. Hisamitsu modified by Delnick teach the limitations of claim 1, as described above. Triplett was used to teach an electric motor powered by a plurality of rechargeable batteries.

9. Munshi does not teach a pattern of individual insulating particles having a plurality of interstitial spaces therebetween, with electrolytes occupying said spaces (claim 7).

Munshi was not used to teach this limitation of claim 1. Hisamitsu modified by Delnick teach the limitations of claim 1, as described above. Munshi was used to teach an electrolyte layer comprising olefin resins as individual insulating particles.

11) *Related Proceedings Appendix*

None.

For the above reasons, it is believed that all the rejections should be sustained.

Respectfully Submitted,

/Adam A Arciero/

Examiner, Art Unit 1795

Conferees

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